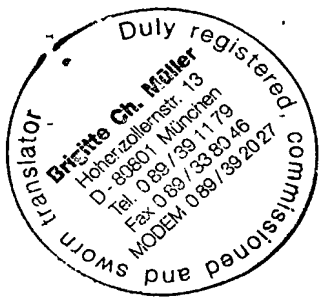
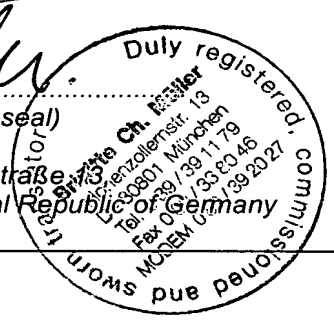


As a state-certified, duly registered and commissioned translator for the English language, in Bavaria/Germany publicly appointed and generally sworn by the President of Munich I Regional Court (Landgericht München I), I hereby certify that the following English translation of the document submitted to me in the German language is correct and complete.
Munich I Regional Court Reg. No. UE 131/91

Munich, 9 May 2005

.....
(Sworn translator's signature and seal)

Brigitte Ch. Müller, Hohenzollernstraße 13
D-80801 Munich, Bavaria, Federal Republic of Germany



Circuit arrangement and method for digital television reception in mobile television receivers

The invention relates to a circuit arrangement for digital television reception in mobile television receivers according to the features of the generic part of Claims 1 and 15 and a method of achieving this according to the features of Claims 14 and 21.

Apart from reception systems for the reception of analogue television signals ("analogue television"), reception systems for the reception of digitally broadcast television signals ("digital television") are also now in use. Digital reception systems will in future gain in importance, because more and more radio broadcasting establishments are moving to broadcasting their programmes digitally. This applies not only to radio programmes, which are already partially broadcast digitally, but increasingly also to television programmes which are broadcast digitally. Pilot projects, which broadcast digital television, are now running in Berlin and other cities. Digital television is known under the designation DVB-T "Digital Video Broadcasting Television".

For the reception of these DVB-T signals special digital reception systems are required. The "analogue" reception devices are not suitable for this.

With analogue radio broadcasting, irrespective of whether it is radio or television, the information to be transmitted is propagated in waves by radio. In contrast, digital technology packs the data as a code of zeroes and ones in data packets. At the receiver these data packets are then decoded again. Previously, digital radio and television was distributed by satellite and then passed to the end customers by cable. With DVB-T the final transmission now also occurs terrestrially, that is "through the air", using transmitting masts located on the ground.

The signal is transferred according to the standard for the digitisation of TV signals, MPEG-2 (Motion Pictures Experts Group, 2nd standard). DVB transports the information in the form of equal sized data packets according to the "container concept". In this way television signals, audio signals and data can be transmitted combined in one MPEG transport stream. Since the frequency spectrum available is limited, the signals are reduced and compressed before transmission so that the data rate to be transmitted is as low as possible. With the MPEG-2

method the data rate for a television programme can be selected between 2 Mbit/s and 15 Mbit/s.

Digitally, 3-5 Mbit/s are needed for a picture quality which is equivalent to a current analogue PAL television signal. The MPEG coding enables a number of television programmes and other data content to be transmitted over one analogue transmission channel (7 or 8 MHz bandwidth).

For DVB-T three modulation methods have been defined:
QPSK, 16-QAM and 64-QAM. Together with other selectable system parameters they fulfil different requirements on transmission and reception. For example, the protection against transmission errors can be selected at different levels. Through this flexibility there is the possibility of determining the number of programmes to be transmitted and the type of reception, e.g. whether reception is to be mobile, portable with bar antenna or stationary. DVB-T transmitters operate with transmission according to the COFDM method (Coded Orthogonal Frequency Division Multiplex). The main principle of this method is the distribution of the information over many, tightly spaced carrier frequencies. With the interference of single carriers on the transmission path an error correction can be carried out in the reception device using a certain computation method, so that the viewer receives an undisturbed picture.

Mobile television reception, that is for example within motor vehicles, requires a very high level of data protection to provide a robust signal for interference-free reproduction of the digitally transmitted audio and video data along with the transmitted "miscellaneous data".

"Miscellaneous data" is taken to include such information which does not have a direct connection with the picture content directly displayed on the screen nor directly with the associated sound. Such "additional data" can - similar to the familiar videotext data - be additional information which for example facilitates a programme guide (television newspaper), a channel allocation of the received signals or an interactive user communication with services. The "miscellaneous data" may be pure data or also completely executable software, whereby the latter initiates actions on being called. The "miscellaneous data" can also be organised according to the MHP standard or in a similar manner (further details can be found, for example, under www.mhp.org and www.dvb.org).

This is where this invention applies.

The object of this invention is to provide a method and a circuit arrangement for digital television reception in mobile television receivers such that the storage, handling and processing of the "miscellaneous data" received along with the audio and video signals is arranged comprehensively and flexibly, but adapted to the difficult mobile reception conditions.

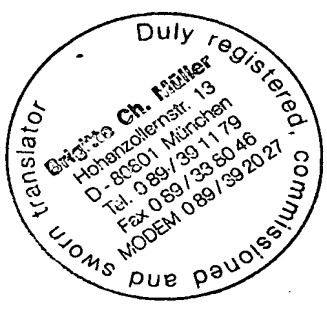
This object is solved with regard to the circuit by the features of Claims 1 and 15.

The object of Claims 14 and 21 is a method according to the invention for realising digital television reception.

Further developments are the object of the subclaims which refer to these two claims.

According to the invention, a method and a circuit arrangement are claimed in which a digital television reception unit is connected to a distributed system, i.e. a network. Also at least one operating unit - also known as an MMI (Man Machine Interface) - and at least one display are connected to this network. The relevant television programme and the corresponding sound signals can be recalled on the display and an associated audio reproduction device. Via the operating unit, the user can call up the desired programme, and also additional data and can make entries which will be explained in more detail. It is important for the circuit arrangement according to the invention and the method according to the invention that the miscellaneous data contained in the received digital signal is separated from the video and audio signals within the digital television reception unit and evaluated, selected, sorted and saved within the digital television reception unit. For this purpose a memory device is used which is provided in the digital television reception unit, preferably a mass storage device, the organisation and management of which is realised by a control device also arranged in the digital television reception unit.

The video and audio signals are in contrast not saved in this memory device, but rather passed via the operating unit to the said display and audio device of the distributed system. A direct



forwarding of the miscellaneous data contained in the transport stream of the received digital television signal does not take place with the method according to the invention or the circuit arrangement according to the invention. Rather, the organisation and management of these data is carried out exclusively within the digital television reception unit. The specific calling of single memory contents in the memory device is however also possible in that an appropriate command is given to the control unit of the digital television reception unit via the operating unit of the distributed system and the said control unit in turn calls the corresponding information in the memory device and puts it onto the network preferably asynchronously so that it can be output on the display or on the audio device.

A number of advantages are related to the circuit arrangement according to the invention and the method according to the invention. Firstly, the memory device can be formed as a mass storage device and filled with a large number of items of information which are obtained from the miscellaneous data of the received signal. Where a number of DVB-T receiver modules are provided within the digital television reception unit, the miscellaneous data of a programme which is not being currently watched by a user can be written to the memory as it were in the background, provided a second DVB-T receiver module is available and is not at the moment receiving programmes watched by the user. The user then has access to enlarged information content in the memory device in comparison to those solutions in which the miscellaneous data which is assigned to a single programme is exclusively written to the memory device.

Furthermore, by moving the memory device into the digital television reception unit, it is ensured that only the miscellaneous data actually requested by the user has to be transmitted on the network. The result is a reduced network occupancy. Finally, a faster access to desired user data is ensured by the limited transmission bandwidth of a distributed system, which, for example, can be organised as a MOST bus.

The invention is particularly suitable for the difficult and often changing reception conditions of mobile reception, e.g. in a motor vehicle.

The invention is described and explained in more detail based on figures in conjunction with an embodiment. The following are shown:

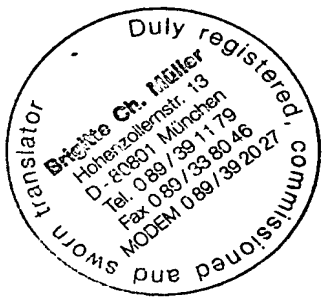


Fig. 1 a block diagram of a circuit arrangement according to the invention with a network to which the arrangement according to the invention is coupled, and

Fig. 2 a detailed block diagram of the reception device according to the invention for the reception of digital, terrestrially received television signals.

Fig. 1 illustrates a block diagram of an arrangement according to the invention. The arrangement exhibits, as a distributed system, an optical bus of ring-shaped structure, which in this case is set up as a MOST (Media Oriented Systems Transport) bus. Various components with associated interface devices are connected to this network 10. In this embodiment a digital television reception unit 50 with one or more DVB-T receiver modules is connected to the network 10. Furthermore, one or more operating units 30, one or more displays 20 and also a wireless telephone system 70 are connected to the network 10.

The system illustrated in Figure 1 is, for example, installed in a motor vehicle and is also suitable, apart from other functions, for receiving digital television signals. One of the two displays illustrated in Figure 1 is positioned in the front section of the vehicle between the driver and the front-seat passenger, whereas the other display is mounted in the rear section of the vehicle, that is near the rear passengers. The same applies to the two operating units 30 illustrated in Figure 1, of which one operating unit is located within the reach of the driver or front-seat passenger and the other operating unit within the reach of the passengers on the rear seats.

Via the operating units 30, the user can select which television program is to be displayed on the display 20 and reproduced on the audio devices, which are not shown in Figure 1 for the sake of clarity.

Using the operating units 30, the user can however also request from the digitally received television signal additional information which is not directly related to the actual picture content or to the associated sound signal. With digital television, apart from the actual video and audio signals, also miscellaneous data can be transmitted which a user can optionally access. The

miscellaneous data may, for example, involve the now familiar EPG (Electronic Program Guide) techniques. Here, a type of electronic television magazine is involved which enables the user of digital television signals to be informed about the current programmes, or also about forthcoming programmes and programme critiques, etc. Apart from this EPG system, it is now also known that information according to the MHP (Multimedia Home Platform) system can be called. With this system an interactive communication between the user and service facilities can also take place. In order that the user can, using his operating unit 30, call up as much information as is possible which is included with the received television signal, the circuit arrangement for the reception of digital television signals exhibits a special structure which is clarified in conjunction with Figure 2.

The digital television reception unit 50 is illustrated in Figure 2. The television reception unit 50 exhibits on the input side preferably a number of DVB-T receiver modules 51. A multiplex transport data stream, which is fed to a demultiplexer device 52 via a data line 70, is present on the output of these receiver modules 51. The data on the line 70 has a format which is subdivided into PES (Packetized Elementary Stream) blocks. On the output of this demultiplexer device 52 there are three different signals: An audio signal with data organised in PES blocks, which is fed on the line 71 to a matching stage 53; a video signal with data organised in PES blocks, which is fed on a line 72 to the matching stage 53; and data similarly organised in PES blocks which represents neither video nor audio signals, but rather contains additional information (e.g. EPG; MHP) and is fed on a line 73 to an evaluation unit 56. In this evaluation unit 56 the content of the miscellaneous data, present on the line 73, is evaluated.

The matching stage 53 is not absolutely necessary, but is however advantageous for carrying out a transcoding, re-encoding or data rate conversion of the audio and / or video signals. These video and audio signals, optionally recoded or with their sampling rates converted, are passed via the lines 74, 75 - still as PES blocks - to a multiplex device 54. This multiplex device 54 optionally multiplexes the two audio and video signals present on the lines 74 and 75 into a single data stream which is passed via the line 76 to a network interface 55, here a MOST interface. However, it is also possible (see broken line 82 in Fig. 2) for the audio and / or video signal to be converted or transcoded in the matching stage 53 into a PCM signal and passed directly to the network interface 55. From the MOST interface 55, the audio and video signals

pass to the network 10 and then to the displays 30 illustrated in Figure 1. The miscellaneous data received via line 73 is saved in a memory device 58 according to specified criteria. The specified criteria for saving this miscellaneous data in the memory device 58 are held in a control device 57, which, for this purpose, is linked on one hand to the evaluation circuit 56 via a line 77 for the reception of the miscellaneous data and is also linked to the memory device 58 via a further line bus 78. The control device 57 provides, for example, sorting of the data, management of the data within the memory device 58 and successful security, plausibility and / or completeness checks. The control device 57, which forms a server unit 59 together with the memory device 58, is also linked to the interface 55 via a bi-directional line bus 79, to the demultiplexer device 52 via the line bus 80 and to the DVB-T receiver modules 51 via the line bus 81.

In practice the operation of this arrangement is as follows.

Using the operating unit 30 assigned to him, the user selects an appropriate television programme, which is presented to him on the display 20 and an associated audio device. The command for the programme selection passes via the operating unit 30 via the network 10 to the digital television reception unit 50 and here to the control device 57 via the interface 55 and the line bus 79. This control device 57 ensures that at least one of the DVB-T receiver modules 51 is activated and the desired programme received. The video and audio signals associated with this programme pass via the said stages 52, 53, 54 and 55 to the network 10. The miscellaneous data assigned to this programme is saved organised in the memory device 58 via the line 73 and the evaluation stage 56. The control device 57 now ensures that if possible all of the miscellaneous data received on the channel is written contiguously into the memory device 58, irrespective of whether the user calls it or not. Where the received miscellaneous data is repeated cyclically, the control device 57 can ensure that a check is made of whether this miscellaneous data has been correctly saved in the memory device 58. If, using known plausibility or completeness tests, the control device 57 finds that data is missing or has been erroneously written to the memory device 58, corresponding new or correct data is written to the memory device 58.

Additionally, the control device 57 can ensure that not only the miscellaneous data associated with the programme being currently received is written to the memory device 58, but rather also such miscellaneous data which is assigned to other programmes. For this purpose, the control device 57 must initiate the demultiplexer device 52 to make the miscellaneous data of other programmes available on the line 73. After a certain time period this results in the memory device 58 having a large amount of information at its disposal which is made up of the miscellaneous data of all available programmes. A user therefore has the possibility of recalling this data quickly and individually.

Furthermore, it is ensured that a user always has the correct data. If, for example, a currently applicable programme table is saved in the memory device 58, then during mobile reception, that is with a movement of the vehicle with difficult reception conditions, the programme table, which is transmitted via the miscellaneous data, can be continuously overwritten. The user then always has available an updated, applicable programme table.

The circuit arrangement according to the invention of a digital television reception unit, which is connected to a network, provides for the organisation of the memory device 58 and control device 57 as a server. The data saved in the memory device 58 can also be program data which starts when certain software is called.